

Quarterly Progress Report

Project Title:	Handheld Devices on Rail for Fare Collection and Communication		
NJDOT PROJECT NUMBER: 2011-05		NJDOT RESEARCH PROJECT MANAGER: Daniel LiSanti	
TASK ORDER NUMBER: 274		PRINCIPAL INVESTIGATOR: Dr. Eric Gonzales / Dr. Kaan Ozbay	
Project Starting Date: 9/12/2011 Original Project Ending Date: 9/12/2013 New Project Ending Date: 2/28/2014		Period Starting Date: 07/01/2013 Period Ending Date: 09/30/2013	

1. Project

<u>Task No.</u>	<u>Task Description</u>	<u>Percent of Total Project Budget</u>	<u>Cost of Task</u>	<u>% of Task This Quarter</u>	<u>Cost This Quarter</u>	<u>% of Task to Date</u>	<u>Total Cost to Date</u>
1	Review of Available Technologies and Lessons Learned from Other Agencies	14%	\$44,273	0%	\$0	100%	\$44,273
2	Develop an Evaluation Plan	10%	\$31,904	0%	\$0	100%	\$31,904
3	Evaluate the Selected Technology	45%	\$139,588	5%	\$6,979	85%	\$118,650
4	Recommendations	20%	\$63,410	19%	\$11,937	74%	\$46,816
5	Final Report and Project Management	10%	\$31,020	18%	\$5,459	78%	\$24,071
Total		100%	\$310,195	8%	\$24,375	86%	\$265,714

Progress Summary

2. Project Overview

Project Abstract

NJ Transit, among other transit agencies and companies in the US, is interested in implementing electronic fare collection (EFC) technology. Despite the range of benefits of EFC, commuter rail systems have been slow in adopting the technology, mostly because the open, barrier-free layout of many commuter rail stations makes it hard to implement EFC systems. Clearly, using the EFC technology that was designed for closed systems such as subways, or rail systems that do not have frequent stops, such as Amtrak long-distance intercity service, might not be suitable for the NJ Transit's needs.

In this case the Rutgers research team will start the project, in coordination with NJ Transit staff, with an assumption that an electronic fare technology developed by ACS Technologies will be the focal point; this is the technology identified, to this point, as the most promising one by NJ Transit, and, if validated during the course of this study, will be the subject of a demonstration and an objective third-party evaluation.

The research will also gather and assess relevant information regarding the technologies and past experiences in terms of using these electronic fare technologies by various national and international transit agencies.

Project Objectives

The main objective is to assist NJ Transit (NJT) in the selection and demonstration of an electronic fare technology in the NJT commuter rail and in conducting an objective third-party evaluation of the selected technology's effectiveness. Various objectives have to be achieved to realize this goal. The most important objectives are:

- The research team will assist NJ Transit in the selection and demonstration of an electronic fare technology.
- NJ TRANSIT will develop system architecture for electronic fare collection media that integrates the use of handheld devices in validating tickets on board, connects with NJ

Transit's existing revenue control and fare gate systems, and enables communications between train crews that will be best suited for NJ Transit.

- NJ TRANSIT will determine the functional requirements of handheld validation devices and the new mobile ticketing application for customers.
- The research team will participate in customer and employee focus groups and interviews to evaluate the usability of the new technology.
- The research team will develop an analytical approach to evaluate the usability of the new technology, which will be used to improve the technology for the initial limited pilot and eventually the full rollout of the technology to all Pascack Valley Line (PVL) customers.

3. Description of Work Completed by Task over This Period

Task 1 — Review of Available Technologies and Lessons Learned from Other Agencies

This task is completed.

Deliverable: A final literature review document.

Task 2 — Develop an Evaluation Plan

The mobile ticketing program was expanded from the PVL to the Main/Bergen Lines in September 2013. A second field evaluation plan has been prepared to assess the performance of the latest version of the MyTix app and its performance on the Main/Bergen Lines all the way out to Port Jervis, New York. The criteria for evaluation on Main/Bergen are the same as for the PVL, but the schedule of runs has been designed to collect observations of passage through the fare gates at Secaucus Junction. Although the PVL field evaluation generally went well, there were a number of issues related to scanning barcodes at Secaucus, so the evaluation will address this again since changes have been made to application to achieve more consistent scans.

The field evaluation of Main/Bergen is scheduled for Monday, October 28, 2013. The evaluation will involve at least 6 student researchers using iOS and Android devices on ATT,

Verizon, and T-Mobile networks. As was done for the PVL, the evaluation will be conducted as a series of ticket purchases for station pairs along the Main/Bergen Lines. Table 1 shows the planned number of tests corresponding to each station. Trips all the way to Port Jervis will be conducted only in the morning, so that more observations can be collected on busier parts of the line in New Jersey in the afternoon.

Table 1. Planned field test at each Main/Bergen station

Station	Number of Tests		
	AM	PM	Total
Hoboken	-----	6	6
New York	6	6	12
Secaucus	18	12	30
Rutherford	2	2	4
Garfield		4	4
Plauderville	3	1	4
Broadway (Fairlawn)	2	2	4
Radburn (Fairlawn)	2	2	4
Glen Rock (Boro Hall)	2	2	4
Kingsland	1	3	4
Lyndhurst	2	3	5
Delawanna	2	2	4
Passaic	2	2	4
Clifton	1	3	4
Paterson	1	3	4
Hawthorne	2	2	4
Glenrock (Main Line)	2	3	5
Ridgewood	0	7	7
Ho-Ho-Kus	3	2	5
Waldwick	3	2	5
Allendale	2	2	4
Ramsey	3	2	5
Ramsey Route 17	3	2	5
Mahwah	1	3	4
Suffern	6	6	12
Sloatsburg (NY)	3	-----	3
Tuxedo (NY)	3	-----	3
Harriman (NY)	3	-----	3
Salisbury Mills (NY)	3	-----	3
Campbell Hall (NY)	3	-----	3
Middletown (NY)	3	-----	3
Otisville (NY)	3	-----	3
Port Jervis (NY)	6	-----	6

Deliverables: (1) Field evaluation test plan of the MyTix app at the PVL line (2) Script to read and compile transaction data log of the mobile ticketing app.

Task 3 — Evaluate the Selected Technology

Field Evaluation Tests

The field evaluation for the Main/Bergen Lines is currently under way, and the evaluation results will be prepared for the next quarter.

Overview of MyTix Transaction Data Analysis

NJ TRANSIT has provided the Rutgers team with transaction data since the launch of MyTix. Over this time period, the adoption of the technology has grown substantially. Between April 24, 2013 and October 15, 2013, there have been 43,995 downloads of the MyTix app, 71.4% of these which were on iOS devices. Of these downloads, 24,870 users registered with the system to be able to purchase tickets and passes. Figures 1 and 2 show these downloads and registrations each month. Although the summer period showed steady rates, this has increased in the fall as the program has expanded beyond the PVL.

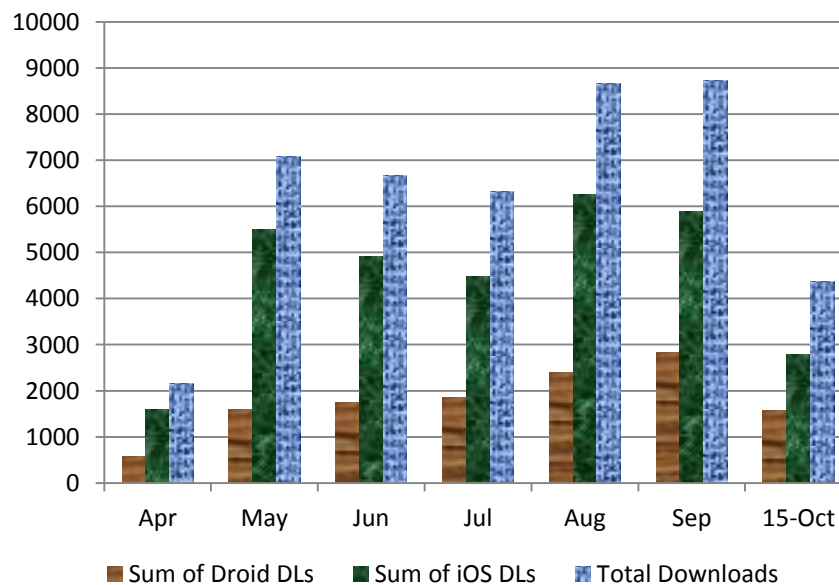


Figure 1. MyTix Application Downloads

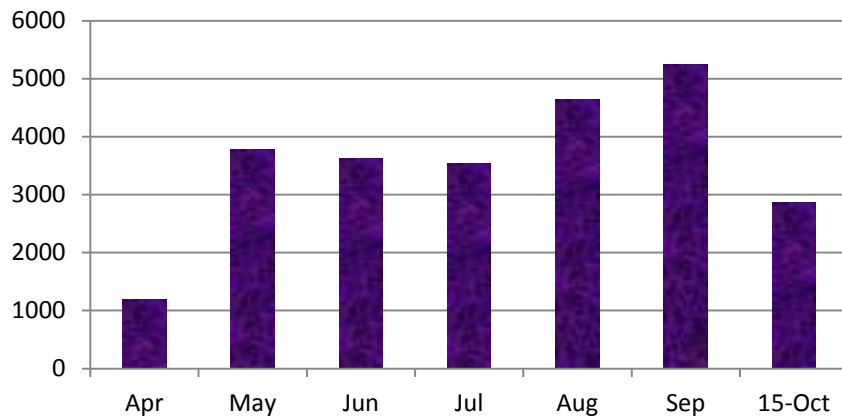


Figure 2. New Registered Users

This steady rate of adoption is also reflected in the count of total active MyTix users, shown in Figure 3. Through the summer, the total number of users increased steadily, but sharp growth has been observed since expansion to the Main/Bergen Line in mid September. The rate of adoption from May 1 to September 15 was approximately 10 new active users per day. Since expanding to the Main/Bergen Line, this has increased to about 38 new active users per day. As NJ TRANSIT continues to expand the deployment of mobile ticketing, this rate can be expected to continue increasing as more and more potential customers are eligible to use MyTix.

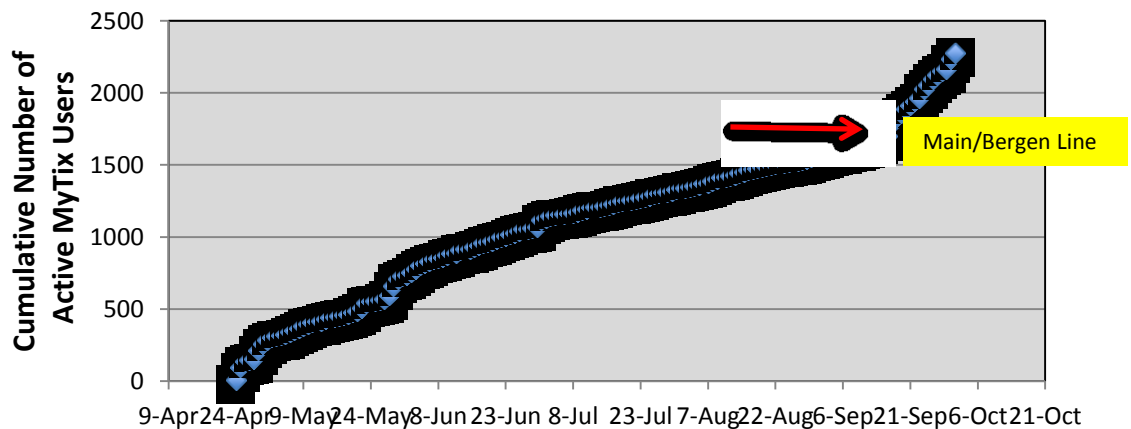


Figure 3. Total Active MyTix Users

The MyTix app has been developed so that users can purchase passes as well as single ride tickets on their mobile devices. The purchases of monthly tickets show increasing sales and 61% of monthly tickets are purchased consecutively, meaning they follow a purchase from a previous month. These repeat sales are illustrated in Figure 5. With people taking vacations during the summer months, these data do not tell a complete story about how satisfied customers are with the monthly pass program. More telling statistics will be available as we see rates of adoption and repeat purchase in the fall months.

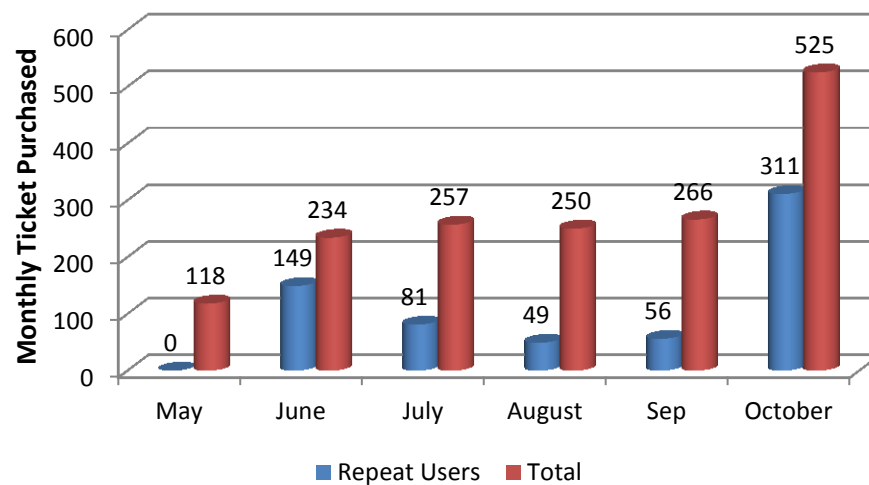


Figure 5. Purchases and Repeat Purchases of Monthly Tickets

Deliverables: (1) MS Word document describing the field evaluation test plan (2) A technical memorandum describing the results of the field evaluation tests. (3) MS PowerPoint presentation describing the results of transaction data analysis in detail.

Task 4 — Recommendations

Most recommendations related to the MyTix app and mobile ticketing program have been reported as part of a technical memorandum that addressed the findings from the field evaluation in the previous quarter. One recommendation based on observations of NJ TRANSIT's

deployment and the marketing of mobile ticketing in other agencies is that NJ TRANSIT could advertise MyTix more prominently on the website and on trains. Perhaps it makes sense to hold off a large marketing campaign until MyTix is available system-wide by the end of the year. Currently, it appears that people are discovering the option by word of mouth, but a marketing campaign to get provide visibility for MyTix would have potential to substantially increase adoption of the technology.

Deliverables: A technical memorandum describing the evaluation of MyTix app and the research teams suggestions.

Task 5 — Final report and Project management

The Rutgers team has continued to communicate with NJ Transit to coordinate scheduling of field evaluations with the deployment of the MyTix application. This contact has been through teleconferences, approximately once every 2 weeks.

A draft of the final report is in preparation. Some sections will not be complete until the results of the current field evaluation on the Main/Bergen Lines are complete. The final report will document all of the stages of the research including interviews with other agencies, usability testing of preliminary versions of the application, findings from the field evaluations, and analysis of ticket purchase and app usage data.

4. Proposed activities for next quarter by task:

Task 1 — Review of Available Technologies and Lessons Learned from Other Agencies

No activities remain.

Task 2 — Develop an Evaluation Plan

No activities remain.

Task 3 — Evaluate the Selected Technology

The research team will analyze the results of the field evaluation on the Main/Bergen

Lines. This will include statistics on where, when, and one which devices any problems occur. The research team will also continue to monitor and analyze ticket sales and app usage data. Especially as the deployment rolls out across the other lines in the system, the increasing rates of adoption may be tied to where and when additional lines get included.

Task 4 — Recommendations

The Rutgers team will prepare a list of recommendations based on findings from the field evaluation and the ticketing data. Whatever survey results are available and shared with the Rutgers team will also be considered.

Task 5 — Final report and Project management

In order to include evaluation of the Main/Bergen Lines in the project, the final report will be prepared in the coming quarter to include this data. The project end date has been extended until February 28, 2014, so the draft final report will be circulated by November 30 to allow 3 months for review and revision.

5. List of deliverables provided in this quarter by task:

- Field evaluation test plan of the MyTix app at the Main/Bergen line
- MS Word document describing the field evaluation test plan

6. Progress on Implementation and Training Activities:

- N/A

7. Problems/Proposed Solutions:

There are no major problems with the research and technical components of this project. In August, Kaan Ozbay moved from Rutgers to take a position at NYU Poly, so there has been a change of PI in this quarter from Kaan Ozbay to Eric Gonzales, who was formerly a Co-PI on the project. Although the total budget for the project has not changed, a change of budget was requested in order to reallocate some of the funds to a subcontract in order to keep Kaan Ozbay

involved in the project. In addition the project end date has been extended to February 28, 2014, in order to allow time to complete the field evaluation on the Main/Bergen Lines.

8. Project Summary:

Total Project Budget	\$310,195
Total Project Expenditure To Date	\$265,714
% of Total Project Budget Expended	86%

NJDOT Research Project Manager Concurrence: _____ Date: _____